UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/627,355	07/24/2003	Rodolfo Llinas	05986/100K520-US1	2328

7278 7590 08/13/2007

DARBY & DARBY P.C.
P.O. BOX 770
Church Street Station
New York, NY 10008-0770

EXAMINER	
COUGHLAN, PETER D	
ART UNIT	**PAPER NUMBER**
2129	
MAIL DATE	**DELIVERY MODE**
08/13/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/627,355	LLINAS ET AL.	
	Examiner	Art Unit	
	Peter Coughlan	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 June 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *12-46* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *12-46* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *6/15/2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

Detailed Action

1. This office action is in response to an AMENDMENT entered June 15, 2007 for the patent application 10/627355 filed on July 24, 2003

2. The First Office Action of December 15, 2006 is fully incorporated into this Final Office Action by reference.

Status of Claims

3. Claims 1-11 are canceled. Claims 12-46 are pending.

Claim Rejections - 35 USC § 112

4. Claims 12, 20, 28, 29 37 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. These claims state the existence of a 'connection' which is used for receiving an 'input signal.' There are no specific

'connections' mentioned within the specification that are used for receiving 'input signals.'

These claims must be amended or withdrawn from consideration.

Claims 19, 27, 36 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. These claims state the 'clustering' of circuits based on 'higher degree of coupling.' This is not supported within the specification. These no mention within the specification of a 'first cluster' which is characterized by a 'higher degree of coupling.'

These claims must be amended or withdrawn from consideration.

Claims 12, 20, 28, 29, 37 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. These claims use the term 'oscillation generation' which is generated by a circuit. This is only mentioned in ¶0005 and 0062 in describing 'inferior olive' neurons. There is no mention of this 'oscillation generation' which is generated by a circuit. Paragraph pertains to an actual inferior olive neuron.

Paragraph 0062 pertains to what a I/O model should have but it is not described within the specification.

Claim 29 restates the claimed elements in the form of 'generating at a first output terminal an oscillation output.' Claim 37 restates the claimed elements in the form of 'generating at a first output terminal and at a second output terminal an oscillation.'

These claims must be amended or withdrawn from consideration.

Claims 13, 21, 30, 38 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. These claims use the term 'phase characteristic' which is not described in the specification. There is no mention of a 'phase characteristic' being composed of an 'output signal' of a 'first control circuit' which is 'maintained relative' of a 'second control circuit.'

These claims must be amended or withdrawn from consideration.

Claims 12, 20, 28, 29, 37 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. These claims use the phrase

'characteristic information.' 'Characteristic information' is not mentioned within the specification.

These claims must be amended or withdrawn from consideration.

Claim 28 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. This claim states the ability to 'synchronize controlled' which is not mentioned within the specification.

This claim needs to be amended or withdrawn from consideration.

Claims 19, 27 and 36 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. These claims state the difference between 2 clusters based on 'higher degree of coupling' vs. 'lower degree of coupling.' These is no algorithm, method or system described within the specification which illustrates which two circuits results in a 'higher or lower coupling result.

These claims need to be amended or withdrawn from consideration.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

The term "higher degree of coupling between circuits" in claims 19, 27, 36 is a relative term which renders the claim indefinite. The term " higher degree of coupling between circuits " is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. These is no defined limit, threshold, method, system or algorithm which describes the terms 'higher degree of coupling' compared to 'lower degree of coupling.'

These claims must be amended or withdrawn from consideration.

Claims 13, 21, 30, 38 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. These claims use the term "maintained relative' within the passage 'phase characteristic' being composed of an 'output signal' of a 'first control circuit' which is 'maintained relative' of a 'second control circuit.' Of these claims. 'Maintained relative' has no defined meaning and the specification is silent regarding its meaning or domain.

These claims must be amended or withdrawn from consideration.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 12-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maass in view of Kawato. ('Pulsed Neural Networks', referred to as **Maass**; 'A computational model for four regions of the cerebellum based on feedback error learning', referred to as **Kawato**)

Claim 12

Maass teaches a plurality of control circuits, each control circuit comprising the following elements (**Maass,** p88:32; 'Circuit comprising the following elements' of applicant is equivalent to 'VLSI' of Maass.): an input receiving connection for receiving an input signal (**Maass,** p55:2-12; 'Input receiving connection' of applicant is disclosed by a 'electronic hardware' with 'input and output' abilities of Maass.); an oscillation generation circuit for generating at a first output terminal an oscillation output signal having an amplitude and a frequency (**Mass,** p59:6-16; 'Output' of applicant is

equivalent to 'firing' of Maass. 'Amplitude' of applicant is equivalent to 'amplitudes' of Maass. 'Frequency' of applicant is equivalent to 'oscillatory component' of Maass.); a first spike generation circuit in communication with the oscillation generation circuit for generating a first spike signal when the input signal exceeds a first threshold value, the first spike signal being provided at the first output terminal (**Maass,** p76, Figure 2.12, p78:44 through p79:9; 'First spike generation circuit' of applicant is equivalent to 'layer 1' of Maass. 'Threshold value' of applicant is equivalent to 'threshold gates' of Maass.); a second spike generation circuit in communication with the oscillation generation circuit for generating a second spike signal when the input signal exceeds a second threshold value, the second spike signal being provided at the first output terminal. (**Maass,** p76, Figure 2.12, p78:44 through p79:9; 'Second spike generation circuit' of applicant is equivalent to 'layer 2' of Maass. 'Threshold value' of applicant is equivalent to 'threshold gates' of Maass.)

Maass does not teach wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and wherein characteristic information of the actuating element is provided as part of the input signal to the control circuit.

Kawato teaches wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and wherein characteristic information of the actuating element is provided as part of the input signal to the control circuit. (**Kawato,** p99, C1:14 through C2:19; 'Oscillation output signal' of applicant is equivalent to 'spino olivo

cerebellar paths' of Kawato. 'Controlling an actuating element' of applicant is equivalent to 'robot control experiments' of Kawato. 'Characteristic information' of applicant is equivalent to 'feedback information' of Kawato.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Maass by using the output for control of a physical object as taught by Kawato to have wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and wherein characteristic information of the actuating element is provided as part of the input signal to the control circuit.

For the purpose of paralleling the olivo cerebellar design for robotic movement based on the fact the olivo cerebellar design is a proven design with reliable results.

Claim 13

Maass teaches wherein a phase characteristic of the composite output signal of a first control circuit is maintained relative to a phase characteristic of the composite output signal of a second control circuit. (**Maas,** p63:26 through p65:9; 'Phase characteristic' of applicant is equivalent to 'initial phase length' of Maass.)

Claim 14

Maass teaches at least one coupling element for coupling adjacent control circuits. (**Maass,** p58:16 through p59:5; One example of 'adjacent control circuits' of applicant is disclosed by 'synchronization mechanism' of Maass.)

Claim 15

Maass teaches wherein the coupling element comprises a variable impedance element. (**Maass,** p58:16 through p59:5; 'Variable impedance element' of applicant is disclosed by the ability to alter the spiking neural network with a 'synchronization mechanism' of Maass.)

Claim 16

Maass teaches a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits. (**Maass,** p76 Figure 2.12; 'Coupling between two adjacent control circuits' of applicant is disclosed in al three sections of Figure 2.12. These 'two adjacent control circuits' of applicant is equivalent to 'linking inputs' of Maass.)

Claim 17

Maass teaches wherein the impedance of the coupling elements is altered to thereby modify synchronization between coupled control circuits. (**Maass,** p58:16 through p59:5; 'Impedance of the coupling elements' to 'modify synchronization' of applicant is disclosed by 'the spiking neuron i is not prevented from firing by auxiliary inhibitory neurons' of Maass.)

Claim 18

Maass teaches a command input for controlling the coupling between control circuits. (**Maass,** p58:16 through p59:5; "A command input for controlling' of applicant is disclosed by 'with this method one can simulate any given Boolean circuit' of Maass. Maass illustrates the construction of in a network of spiking neurons.)

Claim 19

Maass teaches a first cluster of control circuits and a second cluster of control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster. (**Maass,** p92:17-35; 'Clusters' of applicant is based on the weight of the feedback of Maass. Those neurons with little feedback would belong to the 'second cluster' while neurons with heavy feedback would belong to the 'first cluster.')

Claim 20

Maass teaches a plurality of control circuits, each control circuit comprising the following elements (**Maass,** p88:32; 'Circuit comprising the following elements' of applicant is equivalent to 'VLSI' of Maass.): an input receiving connection for receiving an input signal (**Maass,** p55:2-12; 'Input receiving connection' of applicant is disclosed by a 'electronic hardware' with 'input and output' abilities of Maass.); an oscillation generation circuit for generating at a first output terminal and a second output terminal an oscillation output signal having an amplitude and a frequency(**Mass,** p59:6-16, p60,

Figure 2.3; ‘Output’ of applicant is equivalent to ‘firing’ of Maass. ‘Amplitude’ of applicant is equivalent to ‘amplitudes’ of Maass. ‘Frequency’ of applicant is equivalent to ‘oscillatory component’ of Maass. ‘Second output terminal’ of applicant is equivalent to the ‘firing times of presynaptic neurons’ of Maass.); a first spike generation circuit in communication with the oscillation generation circuit for generating a first spike signal when the input signal exceeds a first threshold value, the first spike signal being provided at the first output terminal and the second output terminal (**Maass,** p76, Figure 2.12, p78:44 through p79:9; ‘First spike generation circuit’ of applicant is equivalent to ‘layer 1’ of Maass. ‘Threshold value’ of applicant is equivalent to ‘threshold gates’ of Maass.); a second spike generation circuit in communication with the oscillation generation circuit for generating a second spike signal when the input signal exceeds a second threshold value, the second spike signal being provided at the first output terminal. (**Maass,** p76, Figure 2.12, p78:44 through p79:9; ‘Second spike generation circuit’ of applicant is equivalent to ‘layer 2’ of Maass. ‘Threshold value’ of applicant is equivalent to ‘threshold gates’ of Maass.)

Maass does not teach wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a first composite output signal at the first output terminal, and the oscillation output signal and the first spike signal collectively form a second composite output signal at the second output terminal, such that at least one of the composite output signals is capable of controlling an actuating element, and wherein characteristic information of the actuating element is provided as part of the input signal to the control circuit.

Kawato teaches wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a first composite output signal at the first output terminal, and the oscillation output signal and the first spike signal collectively form a second composite output signal at the second output terminal, such that at least one of the composite output signals is capable of controlling an actuating element, and wherein characteristic information of the actuating element is provided as part of the input signal to the control circuit. (**Kawato,** p99, C1:14 through C2:19; 'Oscillation output signal' of applicant is equivalent to 'spino olivo cerebellar paths' of Kawato. 'Controlling an actuating element' of applicant is equivalent to 'robot control experiments' of Kawato. 'Characteristic information' of applicant is equivalent to 'feedback information' of Kawato.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Maass by using a pulsed neural network for robotic control as taught by Kawato to have wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a first composite output signal at the first output terminal, and the oscillation output signal and the first spike signal collectively form a second composite output signal at the second output terminal, such that at least one of the composite output signals is capable of controlling an actuating element, and wherein characteristic information of the actuating element is provided as part of the input signal to the control circuit.

For the purpose of using the proven design of the olivo cerebellar for motor movement.

Claim 21

Maass teaches wherein a phase characteristic of the composite output signal of a first control circuit is maintained relative to a phase characteristic of the composite output signal of a second control circuit. (**Maas,** p63:26 through p65:9; 'Phase characteristic' of applicant is equivalent to 'initial phase length' of Maass.)

Claim 22

Maass teaches at least one coupling element for coupling adjacent control circuits. (**Maass,** p58:16 through p59:5; One example of 'adjacent control circuits' of applicant is disclosed by 'synchronization mechanism' of Maass.)

Claim 23

Maass teaches wherein the coupling element comprises a variable impedance element. (**Maass,** p58:16 through p59:5; 'Variable impedance element' of applicant is disclosed by the ability to alter the spiking neural network with a 'synchronization mechanism' of Maass.)

Claim 24

Maass teaches a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits. (**Maass,** p76 Figure 2.12; 'Coupling between two adjacent

control circuits' of applicant is disclosed in al three sections of Figure 2.12. These 'two adjacent control circuits' of applicant is equivalent to 'linking inputs' of Maass.)

Claim 25

Maass teaches wherein the impedance of the coupling elements is altered to thereby modify synchronization between coupled control circuits. (**Maass,** p58:16 through p59:5; 'Impedance of the coupling elements' to 'modify synchronization' of applicant is disclosed by 'the spiking neuron i is not prevented from firing by auxiliary inhibitory neurons' of Maass.)

Claim 26

Maass teaches a command input for controlling the coupling between control circuits. (**Maass,** p58:16 through p59:5; "A command input for controlling' of applicant is disclosed by 'with this method one can simulate any given Boolean circuit' of Maass. Maass illustrates the construction of in a network of spiking neurons.)

Claim 27

Maass teaches a first cluster of control circuits and a second cluster of control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster. (**Maass,** p92:17-35; 'Clusters' of applicant is based on the weight of the feedback of

Maass. Those neurons with little feedback would belong to the 'second cluster' while neurons with heavy feedback would belong to the 'first cluster.')

Claim 28

Maass teaches a plurality of control circuits, each control circuit comprising the following elements(**Maass,** p88:32; 'Circuit comprising the following elements' of applicant is equivalent to 'VLSI' of Maass.): an input receiving connection for receiving an input signal (**Maass,** p55:2-12; 'Input receiving connection' of applicant is disclosed by a 'electronic hardware' with 'input and output' abilities of Maass.); an oscillation generation circuit for generating at a first output terminal an oscillation output signal having an amplitude and a frequency(**Mass,** p59:6-16; 'Output' of applicant is equivalent to 'firing' of Maass. 'Amplitude' of applicant is equivalent to 'amplitudes' of Maass. 'Frequency' of applicant is equivalent to 'oscillatory component' of Maass.); a first spike generation circuit in communication with the oscillation generation circuit for generating a first spike signal when the input signal exceeds a first threshold value, the first spike signal being provided at the first output terminal (**Maass,** p76, Figure 2.12, p78:44 through p79:9; 'First spike generation circuit' of applicant is equivalent to 'layer 1' of Maass. 'Threshold value' of applicant is equivalent to 'threshold gates' of Maass.); a second spike generation circuit in communication with the oscillation generation circuit for generating a second spike signal when the input signal exceeds a second threshold value, the second spike signal being provided at the first output terminal. (**Maass,** p76, Figure 2.12, p78:44 through p79:9; 'Second spike generation circuit' of applicant is

equivalent to 'layer 2' of Maass. 'Threshold value' of applicant is equivalent to 'threshold gates' of Maass.)

Maass does not teach wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and wherein a sensor is used to obtain characteristic information of the actuating element such that the characteristic information is provided as part of the input signal to the control circuit.

Kawato teaches wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and wherein a sensor is used to obtain characteristic information of the actuating element such that the characteristic information is provided as part of the input signal to the control circuit. (**Kawato,** p99, C1:14 through C2:19; 'Oscillation output signal' of applicant is equivalent to 'spino olivo cerebellar paths' of Kawato. 'Controlling an actuating element' of applicant is equivalent to 'robot control experiments' of Kawato. 'Characteristic information' of applicant is equivalent to 'feedback information' of Kawato.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Maass by using a pulsed neural network for movement of a actuating element as taught by Kawato to have wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and wherein a sensor is used to obtain characteristic

information of the actuating element such that the characteristic information is provided as part of the input signal to the control circuit.

For the purpose of using a reliable and proven design for robotic movement control.

Maass teaches and further wherein the input signal is used to synchronize controlled movement of the actuation elements. (**Maass,** p58:16 through p59:5; 'Synchronize controlled movement' of applicant is disclosed by 'synchronization mechanism' of Maass.)

Claim 29

Maass teaches using a plurality of control circuits, each control circuit performing the following steps (**Maass,** p88:32; 'Circuit performing the following steps' of applicant is equivalent to 'VLSI' of Maass.): receiving an input signal at an input receiving connection (**Maass,** p55:2-12; 'Input receiving connection' of applicant is disclosed by a 'electronic hardware' with 'input and output' abilities of Maass.); generating at a first output terminal an oscillation output signal having an amplitude and a frequency(**Mass,** p59:6-16; 'Output' of applicant is equivalent to 'firing' of Maass. 'Amplitude' of applicant is equivalent to 'amplitudes' of Maass. 'Frequency' of applicant is equivalent to 'oscillatory component' of Maass.); generating a first spike signal when the input signal exceeds a first threshold value, the first spike signal being provided at the first output terminal (**Maass,** p76, Figure 2.12, p78:44 through p79:9; 'First spike generation circuit' of applicant is equivalent to 'layer 1' of Maass. 'Threshold value' of applicant is

equivalent to 'threshold gates' of Maass.); generating a second spike signal when the input signal exceeds a second threshold value, the second spike signal being provided at the first output terminal. (**Maass,** p76, Figure 2.12, p78:44 through p79:9; 'Second spike generation circuit' of applicant is equivalent to 'layer 2' of Maass. 'Threshold value' of applicant is equivalent to 'threshold gates' of Maass.)

Maass does not teach wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and further comprising the step of obtaining characteristic information of the actuating element which is provided as part of the input signal to the control circuit.

Kawato teaches wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal which is capable of controlling an actuating element, and further comprising the step of obtaining characteristic information of the actuating element which is provided as part of the input signal to the control circuit. (**Kawato,** p99, C1:14 through C2:19; 'Oscillation output signal' of applicant is equivalent to 'spino olivo cerebellar paths' of Kawato. 'Controlling an actuating element' of applicant is equivalent to 'robot control experiments' of Kawato. 'Characteristic information' of applicant is equivalent to 'feedback information' of Kawato.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Maass by using a pulsed neural network for control of movement of an actuated element as taught by Kawato to have wherein the oscillation output signal, the first spike signal and the second spike signal

collectively form a composite output signal which is capable of controlling an actuating element, and further comprising the step of obtaining characteristic information of the actuating element which is provided as part of the input signal to the control circuit.

For the purpose of using an established design of the olivo cerebellar for movement control.

Claim 30

Maass teaches wherein a phase characteristic of the composite output signal of a first control circuit is maintained relative to a phase characteristic of the composite output signal of a second control circuit. (**Maas,** p63:26 through p65:9; 'Phase characteristic' of applicant is equivalent to 'initial phase length' of Maass.)

Claim 31

Maass teaches the step of using at least one coupling element for coupling adjacent control circuits. (**Maass,** p58:16 through p59:5; One example of 'adjacent control circuits' of applicant is disclosed by 'synchronization mechanism' of Maass.)

Claim 32

Maass teaches wherein the coupling element comprises a variable impedance element. (**Maass,** p58:16 through p59:5; 'Variable impedance element' of applicant is disclosed by the ability to alter the spiking neural network with a 'synchronization mechanism' of Maass.)

Claim 33

Maass teaches the step of using a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits. (**Maass,** p76 Figure 2.12; 'Coupling between two adjacent control circuits' of applicant is disclosed in al three sections of Figure 2.12. These 'two adjacent control circuits' of applicant is equivalent to 'linking inputs' of Maass.)

Claim 34

Maass teaches the step of altering the impedance to thereby modify synchronization between coupled control circuits. (**Maass,** p58:16 through p59:5; 'Altering the impedance' to 'modify synchronization' of applicant is disclosed by 'the spiking neuron i is not prevented from firing by auxiliary inhibitory neurons' of Maass.)

Claim 35

Maass teaches the step of applying a command input for controlling the coupling between control circuits. (**Maass,** p58:16 through p59:5; "A command input for controlling' of applicant is disclosed by 'with this method one can simulate any given Boolean circuit' of Maass. Maass illustrates the construction of in a network of spiking neurons.)

Claim 36

Maass teaches the step of creating a first cluster of control circuits and a second cluster of control circuits, the first cluster of control circuits being characterized by a higher degree of coupling between control circuits of the first cluster relative to a lower degree of coupling between control circuits of the first cluster and control circuits of the second cluster. (**Maass,** p92:17-35; 'Clusters' of applicant is based on the weight of the feedback of Maass. Those neurons with little feedback would belong to the 'second cluster' while neurons with heavy feedback would belong to the 'first cluster.')

Claim 37

Maass teaches using a plurality of control circuits, each control circuit performing the following steps: receiving an input signal at an input receiving connection (**Maass,** p88:32; 'Circuit performing the following steps' of applicant is equivalent to 'VLSI' of Maass.); generating at a first output terminal and at a second output terminal(**Maass,** p55:2-12; 'First output' and 'second output' of applicant is disclosed by a 'electronic hardware' with 'input and output' abilities of Maass.) an oscillation output signal having an amplitude and a frequency(**Mass,** p59:6-16; 'Output' of applicant is equivalent to 'firing' of Maass. 'Amplitude' of applicant is equivalent to 'amplitudes' of Maass. 'Frequency' of applicant is equivalent to 'oscillatory component' of Maass.); generating a first spike signal when the input signal exceeds a first threshold value, the first spike signal being provided at the first output terminal and the second output terminal (**Maass,** p76, Figure 2.12, p78:44 through p79:9; 'First spike generation circuit' of applicant is

equivalent to 'layer 1' of Maass. 'Threshold value' of applicant is equivalent to 'threshold gates' of Maass.); generating a second spike signal when the input signal exceeds a second threshold value, the second spike signal being provided at the first output terminal. (**Maass,** p76, Figure 2.12, p78:44 through p79:9; 'Second spike generation circuit' of applicant is equivalent to 'layer 2' of Maass. 'Threshold value' of applicant is equivalent to 'threshold gates' of Maass.)

Maass does not teach wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal at the first output terminal, and the oscillation output signal and the first spike signal collectively form a second composite output signal at the second output terminal, such that at least one of the composite output signals is capable of controlling an actuating element, and further comprising the step of obtaining characteristic information of the actuating element which is provided as part of the input signal to the control circuit.

Kawato teaches wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal at the first output terminal, and the oscillation output signal and the first spike signal collectively form a second composite output signal at the second output terminal, such that at least one of the composite output signals is capable of controlling an actuating element, and further comprising the step of obtaining characteristic information of the actuating element which is provided as part of the input signal to the control circuit. (**Kawato,** p99, C1:14 through C2:19; 'Oscillation output signal' of applicant is equivalent to 'spino olivo cerebellar paths' of Kawato. 'Controlling an actuating element' of applicant is equivalent

to 'robot control experiments' of Kawato. 'Characteristic information' of applicant is equivalent to 'feedback information' of Kawato.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Maass by using a circuit design of a pulsed neural network for movement control as taught by Kawato to have wherein the oscillation output signal, the first spike signal and the second spike signal collectively form a composite output signal at the first output terminal, and the oscillation output signal and the first spike signal collectively form a second composite output signal at the second output terminal, such that at least one of the composite output signals is capable of controlling an actuating element, and further comprising the step of obtaining characteristic information of the actuating element which is provided as part of the input signal to the control circuit.

For the purpose of using the olivo cerebellar design with feedback controls which can be used for element actuated control.

Claim 38

Maass teaches wherein a phase characteristic of the composite output signal of a first control circuit is maintained relative to a phase characteristic of the composite output signal of a second control circuit. (**Maas,** p63:26 through p65:9; 'Phase characteristic' of applicant is equivalent to 'initial phase length' of Maass.)

Claim 39

Maass teaches the step of using at least one coupling element for coupling adjacent control circuits. (**Maass,** p58:16 through p59:5; One example of 'adjacent control circuits' of applicant is disclosed by 'synchronization mechanism' of Maass.)

Claim 40

Maass teaches the coupling element comprises a variable impedance element. (**Maass,** p58:16 through p59:5; 'Variable impedance element' of applicant is disclosed by the ability to alter the spiking neural network with a 'synchronization mechanism' of Maass.)

Claim 41

Maass teaches the step of using a plurality of coupling elements, each coupling element connected to two adjacent control circuits to thereby provide coupling between the two adjacent control circuits. (**Maass,** p76 Figure 2.12; 'Coupling between two adjacent control circuits' of applicant is disclosed in al three sections of Figure 2.12. These 'two adjacent control circuits' of applicant is equivalent to 'linking inputs' of Maass.)

Claim 42

Maass teaches the step of altering the impedance to thereby modify synchronization between coupled control circuits. (**Maass,** p58:16 through p59:5;

'Altering the impedance' to 'modify synchronization' of applicant is disclosed by 'the spiking neuron i is not prevented from firing by auxiliary inhibitory neurons' of Maass.)

Claim 43

Maass teaches the step of applying a command input for controlling the coupling between control circuits. (**Maass,** p58:16 through p59:5; "A command input for controlling' of applicant is disclosed by 'with this method one can simulate any given Boolean circuit' of Maass. Maass illustrates the construction of in a network of spiking neurons.)

Response to Arguments

5. Applicant's arguments filed on June 15, 2007 for claims 12-46 have been fully considered but are not persuasive.

6. In reference to the Applicant's argument:

Objections to the Drawings

The Examiner objected to the drawings and the specification. In particular, the Examiner pointed to paragraph [088] which appeared to be inconsistent with Figure 10. In response, applicants have amended paragraph [088] of the specification to be consistent with Figure 10. Furthermore, applicants submit herewith formal drawings to replace the originally filed drawings submitted with this application.

Examiner's response:

The Examiner notes the corrections and withdraws the objection to the drawings.

7. In reference to the Applicant's argument:

Objections under 35 U.S.C. 101

Claims 1-11 stand rejected under 35 U.S.C. §101 as being directed to nonstatutory subject matter. The Examiner is of the opinion that the present claims are directed to a "computer system" which does not have a practical application and which does not produce a real-world result. The Examiner cites to various Patent Office regulations that for a patent claim to have' a "practical application", the focus is not on whether the steps taken to achieve a particular result are "useful", "tangible" and "concrete", but rather it must be the final result achieved by the invention which is "useful", "tangible" and "concrete". According to Patent Office practice, "useful" means that the final result is specific, substantial and credible; "tangible" means that the result is real world and not abstract; and "concrete" means that the result is substantially repeatable and not unpredictable. (MPEP 2106).

Applicants respectfully disagree with the Examiner that the present claims are directed to a nonstatutory "computer system". The method and system of the present invention relates to the generation of various signals (e.g., voltages), which are physical things, and not abstract data signals. Nevertheless, in order to address the issues raised by the Examiner, applicants are presenting herewith a new set of claims, which it is respectfully submitted overcome the issues raised by the Examiner.

In view of the newly presented claims, it is respectfully requested that these rejections under 35 U.S.C. § 101 be withdrawn.

Examiner's response:

Due to a shift in policy by the Office regarding 35 U.S.C. §101, the Examiner is allowed to search the specification to find a practical application. Within the abstract of the invention, the 'system' is used to 'controlling the operation of a six legged walker.' With this control of a six legged walker, the Examiner withdraws the Rejection.

8. In reference to the Applicant's argument:

Claim rejections under 35 U.S.C. 112

Claim 2 stands rejected under 35 U.S.C. § 112, first paragraph, as being based on a non-enabling disclosure. The Examiner states at page 5 of the Office Action: "Pointing out which spike generation is critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure." This statement is not entirely understood. The Examiner goes on to indicate that claim 2 states preserving a phase of the oscillation following spike generation, but that in claim 1, there are two different spikes being generated. In response, applicants have presented new claims 13, 21, 29 and 38 which recite that the phase is preserved following either spike generation, since the Specification does not explicitly limit it to one or the other of the spike generations (see p. 14 of Specification).

Claim 2 also stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The Examiner states that the recited language of preserving the phase of the oscillation is unclear as to whether the preserving is at some location before the threshold, or whether the preserving refers to outputting the phase as part of the result. In response, new claims 13, 21, 29 and 38 have been presented which make it more clear that the preserving of the phase refers to the phase of the output signal.

Examiner's response:

Based on the cancellation of claim 2 by the Applicant, the Applicant's argument is moot and the Examiner withdraws the rejection of Claim 2.

9. In reference to the Applicant's argument:

Claim 11 stands rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. Claim 11 recites that the degree of coupling between processing units within a cluster is greater than the degree of coupling between the processing units of the cluster and other processing units. The Examiner states that this is not described in the Specification. Applicants respectfully disagree with the Examiner. The Specification discusses in detail in numerous instances the concept of coupling between processing units, e.g., neurons. Moreover, the Specification specifically states that in generally, the coupling between units inside

a cluster is stronger than between units at the boundary of clusters." (p. 48, line 22 to p. 49, line 1). This directly supports claims 19, 27, 36 and 44, which include this subject matter from original claim 11.

Examiner's response:

Based on the cancellation of claim 11 by the Applicant, the Applicant's argument is moot and the Examiner withdraws the rejection of Claim 11.

10. In reference to the Applicant's argument:

The Examiner also takes issue with the term "cluster" as used in claims 10 and 11, stating that this term is indefinite and is not defined in the application. Applicants respectfully disagree with the Examiner. The term "cluster" is clearly used in the Specification to refer, for example, to a group of neurons which are related in some fashion. As discussed in detail at p. 33, the term "cluster" does not refer to a specific size group of neurons, but rather to some grouping of neurons where the "shape", "size" and "distribution" of the cluster is controlled by certain chemicals which influence the degree of coupling.

Examiner's response:

Based on the cancellation of claims 10 & 11 by the Applicant, the Applicant's argument is moot and the Examiner withdraws the rejection of Claims 10 & 11. Claims 27 and 36 are rejected based on the lack of written description. The specification does not disclose how clustering is obtained by the 'controlled by certain chemicals which influence the degree of coupling' considering this the invention is based on circuits. The specification lacks explanation where 'certain chemicals' role in on a circuit. Office Action stands.

11. In reference to the Applicant's argument:

Resections Under 35 U.S.C. 102(b)

Claims 1-3, 5-8 and 10-11 stand rejected under 35 U.S.C. §102(b) as being anticipated by Maass, "Pulsed Neural Networks". Applicants will treat this rejection as if it were being applied to the newly presented claims. It is the Examiner's opinion that "Pulsed Neural Networks" discloses all the elements of independent claim I. Specifically, with respect to generating a first spike when a first threshold is exceeded and generating a second spike when a second threshold is exceeded, as required by claim 1, the Examiner states that this is disclosed in Figure 2-12 of this reference.

Applicants respectfully disagree with the Examiner on this point. The newly presented claims recite the generation of a composite output signal in the form of an oscillatory signal combined with one or two spike signals, the first and second spike signals being generated based on different threshold values. In contrast, there is no mention in Maass, either in Figure 2-12C or the accompanying text, of high and low thresholds and generating a spike signal based on different thresholds. It is not clear at all from the cited Maass reference, that there is such generation of output signals as in the presently claimed invention. The Examiner points to the two layer arrangement of Figure 2-12C of Maass, and without apparent support states (p. 7):

Examiner's response:

The claims do not state that spike signals are being generated on different threshold values. Additional, Maass does not state that outputs are being generated on the same threshold value. Office Action stands.

12. In reference to the Applicant's argument:

Maass illustrates a 2 layer neural network. Each neuron in each layer has a 'threshold', therefore whatever the output of the neural network in figure 2.12, it would have to pass through 2 thresholds.

It is respectfully submitted that this aspect of Maass, regardless of whether it is actually adequately disclosed in Maass is not relevant to and therefore does not anticipate the present claims. This aspect of Maass pointed out by the Examiner appears to be a serial arrangement of the two layers, with apparently each layer having a threshold. Thus, it would seem that the ultimate output in Maass would be in effect "gated" by the serially connected threshold-based neurons. This is different from the presently claimed invention where the output is not so serially connected, but is rather a composite output signal containing an oscillation signal and one or two spike signals as the case may be.

With respect to claim 7, the Examiner states that the "Pulsed Neural Networks" reference discloses the claimed "variable degree of coupling" between processing units. On this point, the Examiner relies on Figure 2-12 of the reference. However, a review of this figure reveals that it discloses only the summation of various inputs into a neuron (Figures 2-12 A and B). Figure 2-12C illustrates a network of neurons with just lines connecting them--there is no mention of variable coupling between the neurons. Taken as a whole, this is not the same as the concept of "variable degree of coupling" between processing circuits as set forth in original claim 7, and new claims 15, 23, 32 and 40.

Examiner's response:

The specification is silent regarding the difference between 'serially connection' and 'not so serially connected.' 'Variable degree of coupling' of applicant is a function of feedback of Maass. Office Action stands.

13. In reference to the Applicant's argument:

Rejections Under 35 U.S.C. 103

Claims 4 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over "Pulsed Neural Networks" in view of Maas, "Model-Based Control for Ultrasonic Motors". The Examiner admits that the "Pulsed Neural Networks" reference does not disclose the control of an output device in accordance with the phase of an oscillation.

The Examiner asserts that this latter feature is disclosed in the "Ultrasonic Motors" reference. Further, it should be pointed out that in new claims 13, 21, 30 and 38, the phase of the output signal of one circuit (which is used, for example, to control an actuator) is maintained in a relative sense to the phase of another output circuit, i.e., there is some coordinated relationship between the phases of the two circuits.

Applicants respectfully disagree with the Examiner on this point. A review of the "Ultrasonic Motors" reference indicates that it does not disclose this claimed use of phase. Rather, in this reference, there is merely a mention of adjustment of phase of the input voltage signal to optimize motor conditions (p. 166, column 1, lines 24-26). This is different from maintaining the phase in an output signal in a relative sense to the phase of other output signal of other circuits, as set forth in the present claims.

Examiner's response:

Ultrasonic motors is no longer used as a reference. Kawato is used as a reference for using olivo cerebellar paths for robot control experiments.

Examination Considerations

14. The claims and only the claims form the metes and bounds of the invention. "Office personnel are to give the claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. *In re Prater*, 415 F.2d, 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969)" (MPEP p 2100-8, c 2, l 45-48; p 2100-9, c 1, l 1-4). The Examiner has the full latitude to interpret each claim in the broadest reasonable sense. Examiner will reference prior art using terminology familiar to one of ordinary skill in the

art. Such an approach is broad in concept and can be either explicit or implicit in meaning.

15. Examiner's Notes are provided to assist the applicant to better understand the nature of the prior art, application of such prior art and, as appropriate, to further indicate other prior art that maybe applied in other office actions. Such comments are entirely consistent with the intent and sprit of compact prosecution. However, and unless otherwise stated, the Examiner's Notes are not prior art but link to prior art that one of ordinary skill in the art would find inherently appropriate.

16. Examiner's Opinion: Paragraphs 14 and 15 apply. The Examiner has full latitude to interpret each claim in the broadest reasonable sense.

Conclusion

17. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

18. Claims 12-46 are rejected.

Correspondence Information

19. Any inquiry concerning this information or related to the subject disclosure should be directed to the Examiner Peter Coughlan, whose telephone number is (571) 272-5990. The Examiner can be reached on Monday through Friday from 7:15 a.m. to 3:45 p.m.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor David Vincent can be reached at (571) 272-3080. Any response to this office action should be mailed to:

Commissioner of Patents and Trademarks,

Washington, D. C. 20231;

Hand delivered to:

Receptionist,

Customer Service Window,

Randolph Building,

401 Dulany Street,

Alexandria, Virginia 22313,

(located on the first floor of the south side of the Randolph Building);

or faxed to:

(571) 272-3150 (for formal communications intended for entry.)

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have any questions on access to Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).

Peter Coughlan

8/7/2007

JOSEPH P HIRL
PRIMARY EXAMINER
TECHNOLOGY CENTER 2100